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## (12) United States Patent

## Raggio

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## (54) VACUUM INSULATED GLASS PANEL WITH SPACERS COATED WITH MICRO PARTICLES AND METHOD OF FORMING SAME

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(58) Field of Classification Search

CPC ...... E06B 3/67304; E06B 3/67321; E06B 3/67326; Y10T 29/49982

See application file for complete search history.

## (56) References Cited

### U.S. PATENT DOCUMENTS

49,167 A	8/1865	Stetson
3,030,746 A	4/1962	Firestine et al.
4,138,304 A	2/1979	Gantley
4,580,371 A	4/1986	Akhavi

## (10) Patent No.:

US 9,410,358 B2

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4,653,680	A	3/1987	Regan			
4,683,154	A *	7/1987	Benson et al 428/34			
5,124,185	A *	6/1992	Kerr et al 428/34			
5,134,039	A *	7/1992	Alexander et al 428/614			
5,494,549	A	2/1996	Oki et al.			
5,517,260	A	5/1996	Glady et al.			
5,721,050	A	2/1998	Roman et al.			
5,769,297	A	6/1998	Loomis et al.			
6,083,578	A	7/2000	Collins et al.			
6,420,002	B1	7/2002	Aggas et al.			
6,677,024	B2	1/2004	Jousse et al.			
6,946,171	B1	9/2005	Aggas			
7,070,703	B2		Benning et al.			
(G .: 1)						

#### (Continued)

#### FOREIGN PATENT DOCUMENTS

WO 96/12862 5/1996 OTHER PUBLICATIONS

Shamrock Technologies NanoFLON(R) P 39B Thermoplastic Grade PTFE Additive, MatWeb Material Property Data, obtained from www.matweb.com on Nov. 18, 2011, 2 pages.

(Continued)

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## (57) ABSTRACT

A vacuum insulating glass (VIG) panel comprises first and second panels of glass spaced from another with a separation space therebetween. The VIG panel further comprises spacers disposed between the first and second glass panels to define the separation space. The spacers are generally arranged in a matrix between the first and the second glass panels. The spacers are coated with a coating material comprising particles having an average size of less than about 1 micron. The coating material may be polytetrafluoroethylene particles having an average particle size in a range of about 200 nanometers to about 700 nanometers.

#### 12 Claims, 4 Drawing Sheets

